REMBRANDT – The REMote Beam instRumentation And Network Diagnosis Tool

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Introduction

At FAIR, all beam instrumentation devices and associated data acquisition components will be distributed and installed over a large and partially inaccessible radiation exposed area. Besides operation of the device itself, like acquisition of data, it is mandatory to control also the supporting LAN based components like VME/μTCA crates, front-end controllers (FEC), middle ware servers and more, to reduce trouble-shooting efforts and reaction times on DAQ system failures. Fortunately, many commercial systems provide means for remote control and monitoring using a variety of standardized protocols. REMBRANDT is a Java framework, which allows the authorized user to monitor and control remote systems while hiding the underlying protocols and connection information such as IP addresses, user-ids and passwords.

Architecture

REMBRANDT is based on a client-server architecture, which is shown in Figure 1. The clients as well as the server are fully implemented in Java. Thus, the same application can be started in the main control room (Linux X-terminals) and/or on the office PC (typically Microsoft Windows) and can be distributed via Java webstart.

The REMBRANDT server periodically queries all devices within several separate monitor threads typically every 10 seconds. It also logs changes in the device states into a data base, send notifications by e-mail to maintainers, handles access control and provides a web server for read-only access to the device states and logs.

Several clients are available to the REMBRANDT user. Besides the main control and monitoring tool, clients for system information management, database and user administration are provided. All clients interact with the server exclusively by Remote Method Invocation (RMI), which is a proven standard mechanism within JAVA for procedure calls within a network. Thus, complex subscribe/publish procedures are avoided.

Currently, REMBRANDT supports the following protocols to control (switch on/off, regulate fan speed, etc.) and monitor different types of hardware: SNMP (Simple Network Management Protocol); iAMT (Intel Active Management Technology); IPMI (Intelligent Platform Management Interface); Ping; RDA (remote device access [1] for FESA [2] devices). REMBRANDT also provides direct terminal access to devices via telnet, ssh or iAMT SOL (Serial-Over-LAN). It hides the login information as well as the actual connection specifics, i.e. directly or via a terminal server. Besides obtaining a login shell this is mainly used to oberve the device boot process for diagnostic purposes.

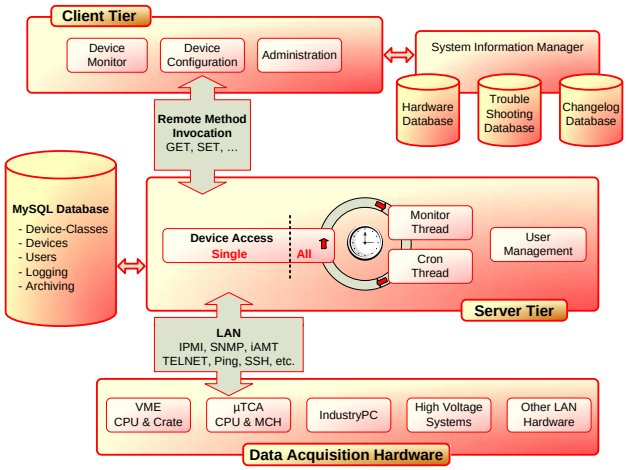

Figure 1: The REMBRANDT software architecture.

Outlook

REMBRANDT will significantly help to keep a status overview over the huge amount of expected BI DAQ and infrastructure systems at FAIR. It is currently in the test phase and already covers over 90% of the foreseen device types. Future development will focus on the scalability with a much larger number of devices and additional protocols like IPMI Serial-Over-LAN or evaluation of logfiles like syslog.

Furthermore, REMBRANDT should be considered as only one, albeit major, pillar in the global remote monitor and control concept for beam diagnostic devices. It is complemented by IP based KVM switches for VGA/USB equipped systems and PLC controlled power supply units of beam line installed DAQ components, such as digital cameras, to provide permanent access and full remote reset capability.

References

[1] N. Trofimov et al., “Remote Device Access in the New CERN Accelerator Controls Middleware”, ICALEPCS’01, San Jose, California, USA, p. 496.

[2] T. Hoffmann, M. Schwickert, G. Jansa, “FESA at FAIR”, PAC09, Vancouver, BC, Canada, p. 4794.

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